

## REMARKS

In the Office Action, the Examiner objected to the drawings under 37 C.F.R. §1.83(a) for not showing every feature of the invention specified in the claims. The Examiner rejected claims 36-41 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner rejected claims 36-39 and 41 under 35 U.S.C. §102b as being anticipated by U.S. Patent 5,980,093 to Jones et al. (Jones). The Examiner rejected claim 40 under 35 U.S.C. §103(a) as being unpatentable over Jones in view of U.S. Patent 5,980,093 to Funaki et al. (Funaki). The Examiner rejected claims 36-41 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,150,193 to Glenn (Glenn) in view of U.S. Patent 6,262,487 B1 to Igarashi et al. (Igarashi).

In this Amendment and Response, Applicants have amended claim 36 and added new claims 48-50. Applicants have not added, amended, or canceled any other claim. Accordingly, claims 36-41 and 48-50 will be pending in the application upon entry of this Amendment.

### **I. Objection to the Drawings**

In the Office Action, the Examiner objected to the drawings under 37 C.F.R. §1.83(a) for not showing every feature of the invention specified in the claims. Applicants respectfully direct the Examiner's attention to Figures 14-15 and the description in paragraph 85 of the specification in the present application. Applicants respectfully submit that these figures show every feature of the invention specified in the claims. For instance, Figure 15 shows a plurality of conductors with wires deposited in two directions along an effective preferred direction. Figure 14 shows the relationship of the effective preferred direction to an angle A, where the tangent of the angle A is approximated by the sum of the wire lengths along a horizontal axis and the sum of the wire lengths along a vertical axis. In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the objection to the drawings under 37 C.F.R. §1.83(a).

## **II. Claim Rejections**

### **A. Rejection of Claims 36-41 under §112, second paragraph**

The Examiner rejected claims 36-41 under §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants respectfully submit that claims 36-41 particularly point out and distinctly claim an integrated circuit with simulated Euclidean wiring using wires deposited in orthogonal directions, which Applicants regard as the invention. Further, as mentioned above in response to the Examiner's query regarding the figures, Applicants respectfully direct the Examiner's attention to Figures 14-15 and the description in paragraph 85 of the specification in the present application. In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the §112 rejection of claims 36-41.

### **B. Rejection of claims 36-41 under §102(b) and §103(a)**

The Examiner rejected claims 36-39 and 41 under §102(b) as being anticipated by Jones. The Examiner further rejected claim 40 under §103(a) as being unpatentable over Jones in view of Funaki. Claims 37- 41 are dependent on claim 36.

Claim 36 recites an integrated circuit (IC) that has at least one metal layer. Applicants have amended this claim to recite that the metal layer has at least one thousand conductors effectively deposited in an effective preferred direction to interconnect one or more points within the IC. *See* amended claim 26 on page 2 of this paper; *see also* Figure 15 and paragraph 70 of the specification. Claim 36 shows a plurality of conductors deposited in an effective preferred direction. The effective preferred direction has a direction for at least forty percent of the conductors on the metal layer. Each of the conductors has a first wire in a first Manhattan direction relative to the boundaries of the IC, and a second wire deposited in a second Manhattan direction relative to the boundaries of the IC. The first and second wires each have first and

second ends. The first end of the second wire is coupled to the second end of the first wire. The effective preferred direction of the conductors has an angle,  $A$ , measured relative to the boundaries of the IC, where  $\tan A = Y/X$ .

$Y$  is a line segment with a distance starting from the second end of the second wire and ending at an intersection with a line segment propagated from the first end of the first wire and in the direction of the first wire.  $X$  is a distance measured in the direction of the first wire starting from the first end of the first wire and ending with the intersection of the  $Y$  line segment.

Applicants respectfully submit that Jones does not disclose, teach, or even suggest such an IC. For instance, Jones does not disclose, teach, or even suggest an IC that has:

- at least one metal layer with at least one thousand conductors effectively deposited in an effective preferred direction to interconnect one or more points within the IC;
- an effective preferred direction that has a direction for at least forty percent of the conductors on the metal layer;
- conductors having a first wire in a first Manhattan direction relative to the boundaries of the IC and a second wire deposited in a second Manhattan direction relative to the boundaries of the IC;
- an effective preferred direction of the conductors having an angle,  $A$ , measured relative to the boundaries of the IC, where  $\tan A = Y/X$ ;
- a line segment  $Y$  with a distance starting from the second end of the second wire and ending at an intersection with a line segment propagated from the first end of the first wire and in the direction of the first wire; and
- a distance  $X$  measured in the direction of the first wire starting from the first end of the first wire and ending with the intersection of the  $Y$  line segment.

The Examiner specifically cites Jones' FIG.7C to support the rejection of claims 36-41. Jones' FIG.7C shows planning a route to connect pin 102 to pin 112 for wiring a semiconductor chip surface. *See* Jones FIG.7C. However, Jones does not disclose, teach, or even suggest at least one thousand conductors that are deposited on a metal layer in an effective preferred direction for the metal layer. Jones also does not mention Manhattan directions in relation to the boundaries of an IC. Moreover, Jones does not discuss a relationship of the conductors in terms of segments and angles in relation to the boundaries of an IC. Thus, Jones does not disclose, teach, or even suggest many of the elements recited in claim 36.

Accordingly, Applicants respectfully submit that Jones neither anticipates claim 36, nor renders this claim invalid. As claims 37-41 are dependent on claim 36, Applicants respectfully submit that claims 37-41 are also patently distinguishable from Jones for at least the reasons discussed above in relation to claim 36.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the §102(b) rejection of claims 36-39 and 41, and the §103(a) rejection of claim 40.

**C. Rejection of Claims 36-41 Under §103(a)**

The Examiner rejected claims 36-41 under §103(a) as being unpatentable over Glenn in view of Igarashi. Claims 37-41 are dependent on claim 36. Claim 36 recites an IC as described above.

Applicants respectfully submit that Glenn and Igarashi do not disclose, teach, or even suggest the IC recited in claim 36. For instance, neither Glenn, nor Igarashi, nor their hindsight combination, disclose, teach or even suggest an IC that has:

- at least one metal layer with at least one thousand conductors effectively deposited in an effective preferred direction to interconnect one or more points within the IC;

- an effective preferred direction that has a direction for at least forty percent of the conductors on the metal layer;
- conductors having a first wire in a first Manhattan direction relative to the boundaries of the IC and a second wire in a second Manhattan direction relative to the boundaries of the IC;
- an effective preferred direction of the conductors has an angle, A, measured relative to the boundaries of the IC, where  $\tan A = Y/X$ ;
- a line segment Y with a distance starting from the second end of the second wire and ending at an intersection with a line segment propagated from the first end of the first wire and in the direction of the first wire; and
- a distance X measured in the direction of the first wire starting from the first end of the first wire and ending with the intersection of the Y line segment.

The Examiner states that Glenn's FIG.7C and FIG.8C disclose all the limitations of claim 36, as recited above. However, Glenn does not disclose, teach or even suggest any of these limitations because Glenn shows bonding pad metallizations on a shielding package for connecting an IC to the shielding package. *See* Glenn FIG.7C and FIG.8C. Moreover, Glenn's metallizations are scattered throughout the encapsulating partitions of the shielding package in various orientations and directions. Therefore, Glenn does not disclose, teach, or even suggest at least one thousand conductors effectively deposited in an effective preferred direction on a metal layer where the effective preferred direction is a direction for at least forty-percent of conductors on the metal layer. If Glenn were applicable to the routing of an IC metal layer, Glenn would present a non-useful and inefficiently wired IC that is contrary to the IC recited in claim 36. However, Glenn has to do with bonding pad metallizations of a shielding package, where the

various wiring directions of the package would not have the significance of the effective preferred direction of the IC metal layer recited in claim 36.

The Examiner states that Glenn does not show an IC. Thus, the Examiner cites Figures 1-29, and specifically Figure 5, in Igarashi to show an IC. Igarashi shows four wiring layers with four different wiring directions. *See* Igarashi FIG.1 and FIG.5. However, Igarashi does not show at least one thousand conductors effectively deposited in an effective preferred direction on a metal layer. Further, Igarashi does not show conductors that have a first wire in a first Manhattan direction and a second wire in a second Manhattan direction on a metal layer. Stated differently, all of the elements of claim 36 are recited as being present on at least one metal layer. In contrast, each of Igarashi's directions occurs on different wiring layers. Moreover, Igarashi's use of "X" and "Y" are in reference to layer numbering and do not relate wires having different Manhattan directions to an angle A, and to an effective preferred direction, on a single metal layer, as recited in claim 36.

Thus, neither Glenn, nor Igarashi, nor their hindsight combination, discloses, teaches, or even suggests all the limitations of claim 36. Accordingly, Applicants respectfully submit that claim 36 is patentable over both Glenn and Igarashi. As claims 37-41 are dependent on claim 36, Applicants respectfully submit that claims 37-41 are patentable over Glenn and Igarashi for at least the reasons discussed above for claim 36.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the §103 rejection of claims 36-41.

### **III. New claims 48-50**

Applicants have added new claims 48-50. Claims 49-50 are dependent on claim 48. Claim 48 recites an IC that has a metal layer with a set of at least ten routes on the metal layer. Each particular route on the metal layer is formed by two sets of wire segments that alternate

along only two directions. Each set of wire segments only has wires along one of the two directions. The two directions are approximately perpendicular. A ratio of the length of wire segments along one direction to the length of wire segments along the other direction is approximately equal for all the routes. The ratio is selected so that the routes effectively traverse along the metal layer in a particular effective direction. Claim 49 recites at least one thousand such routes, while claim 50 recites that the first and second routes are parallel in that each of a set of wire segments in the first route is parallel to at least one wire segment in the second route.

Applicants respectfully submit that all new claims are fully supported by the specification. For instance, page 26 of the specification discloses simulating a diagonal wiring direction, through horizontal and vertical wires, by selecting the appropriate lengths for the horizontal and vertical wires. *See also*, pages 2 and 21 of the specification in the present application, which disclose a thousand of such wires and a preferred wiring direction. Also, Figure 15 discloses several parallel routes formed by alternating horizontal and vertical wire segments.

Applicants respectfully submit that none of the cited references disclose, teach, or even suggest such an IC. Accordingly, Applicants respectfully submit that new claim 48 and new dependent claims 49-50 are patently distinguishable from the cited references. In view of the foregoing, Applicants respectfully request examination and allowance of new claims 48-50.


## CONCLUSION

In view of the foregoing, it is submitted that all pending claims, namely claims 36-41 and 48-50, are in condition for allowance. Reconsideration of the rejections and objections is requested. Allowance is earnestly solicited at the earliest possible date.

Respectfully submitted,

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